

# SUPPLEMENT.

## The Mining Journal, RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

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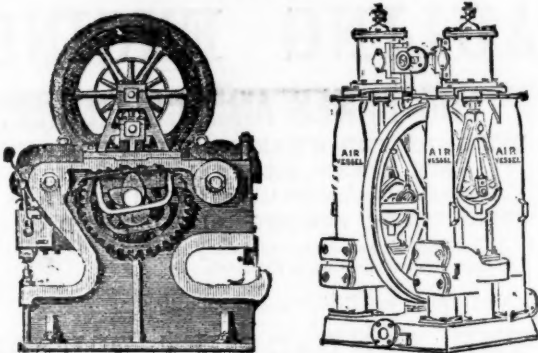
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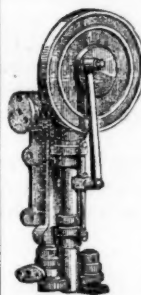
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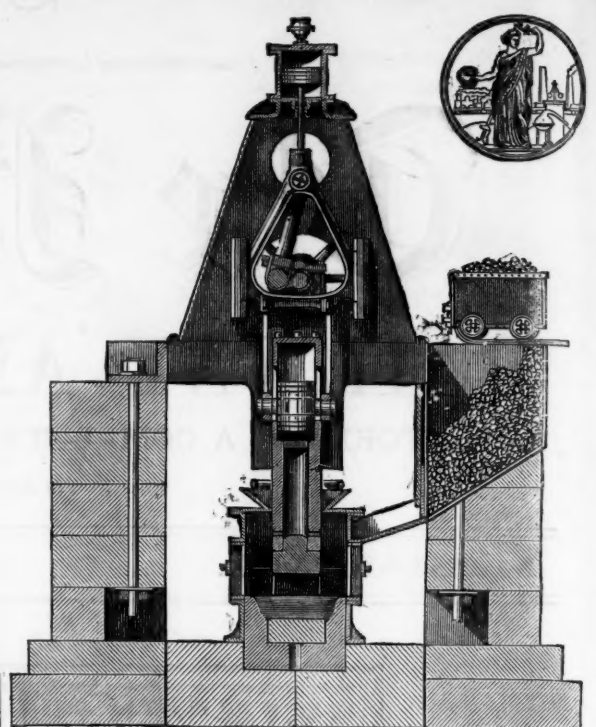
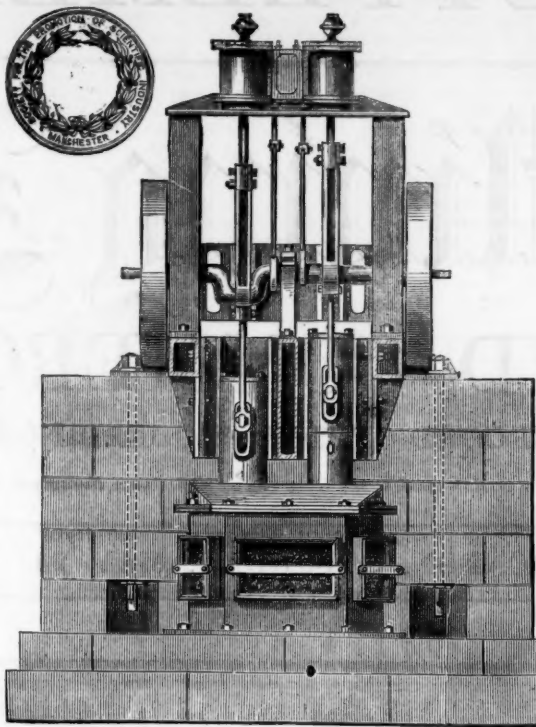
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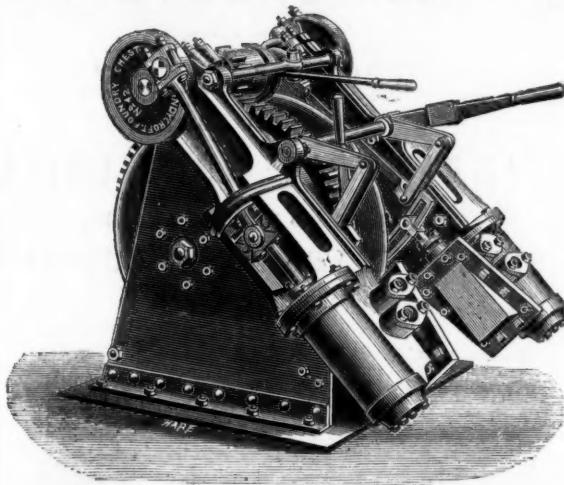
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## Original Correspondence.

## THE ROYAL COMMISSION ON MINE ACCIDENTS—No. III.

SIR.—The ventilation of mines has been a subject of vast "importance" from the days of Agricola to the present time, and many and contending theories have been advocated and carried out for the purpose of keeping a sufficient supply of air in the galleries and workings of mines to dilute and carry off the gases evolved by the minerals, the respiration of men and animals, and the products of combustion of lamps or other lights. From the old-fashioned fire lamp, hung either at the top or bottom of the upcast shaft, improvements gradually arose in the forms of furnaces, steam jets, and, finally, mechanical ventilators. The latter, which are now universally acknowledged to be superior to the older systems in efficiency, economy, and safety, may be divided into two distinct groups or classes:—

1.—Those acting on the principle of "varying capacity," such as the Lemielle, Cooke, and Nixon ventilators.

2.—Those depending on "centrifugal action," such as the Guibal, Waddle, Rammell, Leeds, &c., fans.

The advantages of mechanical ventilation over furnaces, and of the different systems *inter se*, may be gathered from the accompanying table, which is abstracted from a paper read before the North of England Institute of Mining and Mechanical Engineers at Glasgow, by Mr. D. P. Morrison, some years since, these advantages being exhibited in the columns of useful effect and, coals consumed per hour per horse-power in the air. They may, however, be further supplemented by the following additional reasons for the employment of mechanical agency:—

1.—The absence of a large and dangerous open fire in mines where the use of any naked light is strictly prohibited.

2.—The obviating of the cost and inconvenience of keeping in repair and good working order an overheated upcast shaft.

3.—The facility of observing, recording, and regulating the ventilating current by officials on the surface.

4.—The immediate and enormous increase of air obtained by the application of greater power to the driving engine.

5.—The immense importance of having at hand, in case of explosion or accident to the roadways or airways, a power sufficient to clear away the foul air from the workings.

The different systems have been so exhaustively reviewed by advocates and opponents of each particular invention that the main and broad features of the subject alone have been considered necessary in the treatment of the subject in the present brief notice.

ABSTRACT of various Experiments on Different Systems of Ventilation, showing the relative Consumption of Coals for each utilised Horse-power in the air per hour.

Name of Mine.	System of ventilation.	Indicated horse-power of engine.	Quantity of air in mine, cubic feet per minute.	Water gauges.		Horse-power in the air.		Proportions of effective power, utilised (full effect).	Revolutions of fan per minute.	Coals consumed per hour in the air, (7 lbs. under fans).
				At top of shafts, inches.	In mine, inches.	At top of shafts.	In mine.			
Rugeley (160 yards deep)	Furnace	103,325	103,325	0.86	0.62	14.02	10.94	—	—	26.6
Page Bank (100 yards deep)	Ditto	33,997	33,997	0.94	0.90	5.92	5.67	—	—	39.4
North Seaton (265 yards deep)	Ditto	99,750	99,750	1.85	1.10	29.08	17.29	—	—	29.2
Ryhope (480 yards deep)	Ditto	126,386	126,386	2.15	1.00	42.81	19.91	—	—	28.2
Trimdon (160 yards deep)	Ditto	40,000	40,000	0.64	0.50	4.03	3.15	—	—	69.5
Pelton (106 yards deep)	Ditto	36,350	36,350	1.60	0.925	9.16	6.30	—	—	69.8
Tyne Main	Ditto	101,876	101,876	—	1.20	—	14.85	—	—	59.6
Hetton	Ditto	208,466	208,466	—	—	—	39.42	—	—	28.7
Risca, South Wales	Nixon	—	—	—	—	—	—	—	—	17.5
Mountain Ash, South Wales	Nixon	—	—	—	—	—	—	—	—	35.0
Pelton, Durham	Waddle	105.23	99,907	2.65	—	41.719	—	—	—	17.6
Ditto	Waddle	103.44	101,384	2.60	—	41.537	—	—	—	17.4
Framwellgate, Durham	Rammell	88.96	58,951	5.31	—	50.38	—	—	—	12.3
Sacré Madame, Belgium	Guibal	67.75	107,520	2.60	—	44.05	—	—	—	10.8
Pelton, Durham	Ditto	70.79	102,771	2.9	—	46.87	—	—	—	10.6
Ditto	Ditto	74.31	104,229	2.95	—	48.48	—	—	—	10.7
Slaveley, Derbyshire	Ditto	71.91	104,087	2.85	—	46.74	—	—	—	10.8
Trimdon, Durham	Ditto	22.45	57,792	1.60	—	14.57	—	—	—	10.8
Elswick, Newcastle	Ditto	19.73	60,441	1.40	—	13.33	—	—	—	10.4
Whitehaven	Ditto	88.136	128,540	2.80	—	56.713	—	—	—	10.8
Ditto	Ditto	215.913	182,000	5.00	—	143.594	—	—	—	10.6

## COLONEL SHAKESPEAR ON SAFETY-LAMPS.

SIR.—On the 22nd of last month Mr. W. E. Teale decried my lenticular truncated-cone combustion chamber, on the grounds as stated by him—that lenses for safety-lamps had frequently been before the public, with the significant result that there are none in use. Now, it is a most remarkable fact in reference to safety-lamps that parties connected with them always speak much as we do of our butchers' bills. A penny cheaper would be a real blessing! What trash such talk is.

These who have the disposal of life and property counted by hundreds and thousands I urge to rise above the level of half-pence. Numerous as my correspondents are, very few indeed, and all honour to those few, prefer quality to cheapness. The stake is vast, it is risked on the hazard of the die, the cast varying only from 1s. to 2s. 6d. a lamp. Money by hundreds of thousands of pounds is lavished on plant and machinery in forming collieries; yet, when it comes to furnishing light with safety, pence are haggled over to an extent that prohibits quality. The above will convey a true idea of a too prevalent spirit. I venture to think that on no other matter where such great interests are involved is penurious talk so generally resorted to. Such being the case, I doubt most exceedingly that any such lenses as referred to by Mr. W. E. Teale were ever properly made; because, although many struggle to save ½d. over a safety-lamp, how many put down sovereigns to better them?

Very many of my patent lense combustion chambers were made before one was produced that suited my views. Moulds, other special appliances and tools have to be made and paid for. Has anyone except myself ever done that and on my design? Unless they have their opinion is not worth much.

No sooner had I produced what I consider a good glass than a safety-

lamp maker actually proposed to me that he could get them made not so good, but a little cheaper, in Belgium. Now, my glasses are as brilliant as crystal and difficult to break from their peculiar shape, coupled to excellence of make and material; they never break or crack even from excessive heat, unless it be applied for some little time on one side, then they crack, but that is all; they never open or go to pieces. Glass cylinders may fall to pieces, but cones as I construct them can hardly do so; indeed, it seems at variance with mechanical laws that they should; but one of the "Trade" wished to furnish the miner with an inferior article.

Knowing what I do of the too general existence of a feeling that I despise, I raise my humble voice in loud protest against an unfair, unmanly, contemptible system. This is strong language, but the circumstances compel me so to speak. J. D. SHAKESPEAR, *Baron's Court, Fulham, May 21.* F.G.S., Assoc. M. Inst. C.E.

P.S.—In ten trials each with cones and cylinders, the flame being in contact with the glass, the whole twenty cracked within one and a-half minute; but whereas of the ten cylinders all split from top to bottom, started with three or four branches, and four fell to pieces, the whole ten conical lenses are as safe as ever. I have purposely cracked some of these cones three or four times, and were I in explosive fire-damp with them so cracked I should feel perfectly safe, but not so with cylinders that break up in four cases out of ten. J. D. S.

## THE HAULING OF COAL UNDERGROUND.

SIR.—For hauling underground the mine should be properly laid out for the application of machinery. Main roads should be as straight as possible. Where curves are required these should be made with a large radius. Moreover, for permanent engine roads a seam should be selected, where practicable, with a strong roof and floor so as to secure the requisite stability for the rails, and timbering or arching of the roof, as the case may be. On level main roads the hauling in extensive coal mines is now usually performed by engine power instead of by horses, as was the invariable custom in the old times. The hauling on the level may be effected by an engine with main and tail ropes; the main rope, being about the same length of the plane, pulls the full wagons out of the mine; the tail rope, being twice the length of the plane, hauls the empty wagons inwards; the ropes are used to draw alternately, and one road only is required. This system, largely adopted in the North of England collieries, admits not only of working to and from the extremity of an engine plane, but also into any number of intermediate branches. By means of suitable shackles in the main and tail ropes at the several branches the ropes in any one branch can be attached at any time when required to the main ropes.

Another method of hauling on the level is by an engine and endless rope or endless chain. The endless chain system has been largely introduced underground as well as on the surface at collieries in England. For this two roads are required—one for full and one for empty wagons; this causes the first cost of the system to be greater than that of main and tail ropes, but the working expenses are said to be considerably less. The advantages of the endless chain system are the small amount of repairs required, small cost of engine power and labour, the regularity with which the supply of coal to the pit is performed, and facility for increasing or decreasing quantity by altering the speed of the chain. But where the gradients vary, more especially where there are inclinations towards the pit, as well as others in the contrary direction, the load may be so arranged in some cases as to be almost on a balance, requiring little extra engine power to work the plane. A system of endless chain haulage may thus embrace main roads, differing not only in gradient, but also in direction, for the latter at acute turns there is a guiding sheave for the chain and a boy provided at each turn.

The working of the endless chain system is shown by the following example from a modern colliery:—The main chain works on an incline 950 yards in length, dipping from the pit at a gradient of 1 in 13 from A to B; from B a second chain works at right angles to the first on a level for 250 yards, and 250 yards further on a rise inward to point C. The main chain is passed 2½ laps over the engine drum; at the bottom of the incline, at B, it passes 1½ laps over a drum 4 ft. in diameter, placed on an upright shaft. On the same shaft is fixed another drum, 3 ft. 6 in. in diameter, for working the second chain; this chain passes 1½ laps over the drum, and at the other end around a plain pulley fixed on an upright shaft. The engine for working the endless chains consists of two 16 in. horizontal cylinders, 2½ ft. stroke; steam pressure, 42 lbs. per inch; pinion on engine-shaft, 2 ft. in diameter; spur wheel on drum shaft, 8 ft.; the drum is of iron, 4½ ft. in diameter, 15 in. wide, having 12 steel Y's for the chain to hold by. The engine runs at 40 revolutions per minute, and is 41-horse power indicated. The chain moves at the rate of two miles per hour, and will bring out 500 tons of coal in eight hours; including refuse, the quantity will be 550 tons. The main chain is 1950 yards in length, of ¼ in. best cable iron, and its weight is 19 tons. The second chain is 1000 yards in length, of ¼ in. common iron, and its weight is 5 tons 16 cwt. The empty wagons run inbye by a connecting fork on the top of each, in which the chain rests. The full wagons are attached in the same manner on the level part, but in coming up the incline each is attached by a short chain to the main chain.

Coal is supplied to the two chains at three points—at the extremity C, at the point B, and at another point about halfway up the incline. One empty wagon is taken off for each full one connected to the chain. On the main chain, as far down as the first branch, the wagons are 15 yards apart; below that, to the bottom of the incline at B, the distance is 25 yards. Along the second chain the distance apart is 34 yards. The cost of hauling by this system is here about 1d. per ton; formerly, when done by horses, the hauling cost 3d. per ton on the same road. It may be observed that in the endless chain system any number of branches can be worked by placing a pair of wheels fixed on an upright shaft at the junction of each branch, each wheel being made to be connected or disconnected as required.

In the same district another engine works an endless chain in one length on a level for 1150 yards, and up an incline 450 yards further, having a rising gradient of 1 in 10; total length of plane, 1600 yards. In this instance the full wagons descend the incline of 450 yards, the gravity of these being almost sufficient to work the whole of the chain and load. The system is thus capable of considerable modification. Should the incline be extended further, or more wagons be attached in the length of 450 yards, the chain could be worked without engine power. On the other hand, should a further length be added, either on a level or dipping inbye, then greater power would be required from the engine to work the chain.

The endless chain system was introduced at Montague Main Colliery about 22 years ago, and answers admirably. The engine has one 16-in. horizontal cylinder, 2-ft. stroke, making about 55 strokes per minute. The upright shaft and the two chain sheaves fixed thereon are driven by bevel gearing, the pinion being 1 ft. and the driven wheel about 6 ft. in diameter. The sheaves on the upright shaft are 2½ ft. in diameter, with Y's bolted in to hold the chain. One chain passes over each nearly two laps.

It will be seen that there are two chains working from the engine. One chain brings all the coal from the workings through a drift about 1½ mile in length; the mouth of the drift is near the engine. The drift dips inbye slightly for about half its length; the remainder is either on a level or rises slightly to the extremity. This chain is 2½ miles in length, and usually travels at the rate of three miles per hour, bringing out about 400 tons of coal and freelay in 10 hours. The wagons go in and out 25 yards apart, which is sufficient to keep the chain off the bottom of the road; all the coal, &c. is brought from the extremity. Three sharp turns occur on the plane; at each of these points a guiding sheave is fixed aloft between two baulks for the chain at each side. The wagons leave the chain and pass under the baulks, and again connect themselves further on; a boy is required at each turn to look after the tabs, and attach them if required. The chain working on the second sheave of the upright shaft near the engine takes the full wagons as they come from the drift on to the screens a length of about 100 yards, and the empty back again to the same point. The full wagons by an arrangement of the gradients leave the main chain, pass under the sheaves; and

again become attached to the short chain without stopping; the empty wagons return in a similar manner. M. E.

## COAL TRANSPORT TO LONDON.

SIR.—I have read with considerable interest the letters of Mr. W. J. Thompson which have from time to time been published in the *Mining Journal*, but looking at the matter from a consumer's point of view I cannot but think his proposition to send the coal to London in sacks is most objectionable. No one who has noticed the different condition of the coal after 150 miles carriage of a shipment of 24 tons sent in three 8-ton wagons, and of a similar shipment in four 6-ton wagons, would dream of sacking, for it is found the four 6-ton trucks will have nearly twice the quantity of small found in the three 8-ton trucks, and if we had the 24 tons forwarded in 240 sacks, and transhipped at the pit mouth, at the shipping port, at the port of entry, and probably again after a second railway journey, and then after a jolting carriage by cart or wagon, the consumer would, except in the case of very hard North Country coal, get little more than screenings. The value of this unscreened rubbish, as compared with the coal as at present delivered, I need not estimate, but I may suggest that the much lower saleable value of the coal should be taken into consideration by those to whom Mr. Thompson addresses himself.

In the ordinary way of sending coal to market the coal is placed in the trams by the hewer, brought to surface, and lowered on to the screens by patents tips, which lower it so gently that the breakage is inappreciable. During its passage down the screen into the railway wagon the shale and other refuse is picked out, or at least should be picked out, for since the time of the coal famine the colliers have sent up the coal so dirty that it is scarcely possible to pick it properly while on the screens, so that the one fall of from 4 to 6 inches into the wagon is the only shock it has before it leaves the colliery. In Mr. Thompson's system the coal would have to be pitched out of the trams as they come to surface, and in sacking the coal would have an average fall of 2 ft. Now, practically, this does not really break up the coal at once, but shatters it, so that it very readily falls to pieces. This accounts for the fact that when the merchant sends the most carefully screened coal to the consumer there is still an enormous quantity of dust coal put into the cellar.

It will thus be seen that at present the coal leaves the colliery in the best possible condition for carriage, while by Mr. Thompson's system it would leave it in the worst possible condition. Apart from this sack of coal would, by the increased facility for the grinding together of the pieces, produce almost as much small for each mile carried as at present produced in an entire truck, so that the breakage of the coal would be ten times greater than in that carried loose in the wagons. At present in the case of seaborne coal one tip, which, as I have shown, by the arrangements now used involves scarcely any breakage, puts the whole 8 tons into the hold of the vessel. By Mr. Thompson's arrangement 80 sacks would have to be lifted, lowered, and carefully stowed, which at only 20 seconds per sack would occupy about 27 minutes, and the shipping of the sacks would require twice as many men for the 27 minutes as are employed with the wagon system for a single minute. On the vessel reaching its destination the unloading would require 50 per cent. more men for twice the time now necessary. After unloading the consumption of time and number of men required to deliver the coal to the consumer would be the same as at present, so that it need not be considered.

I think Mr. Thompson will not dispute that these are facts, and that being so it will be evident that the coal would reach the consumer in a much worse, if not in an entirely unsaleable, condition, and that Mr. Thompson's alleged economy would be more than counterbalanced by far larger outlay in other directions. *Camberwell, May 20.* CONSUMER.

## THE MINERS' STRIKE.

An eminent statesman at the close of the last century endowed with the power, so rare amongst short-sighted mortals, of looking over the heads of coming ages, exclaimed—"The age of chivalry has passed away, and that of calculators and economists has succeeded." The phantoms of Hope with respect to a permanent settlement of the miners' wages question being dissolved, and all conjectural estimate being futile, self-opinionateness must give way to an equitable adjustment of the cause of constantly recurring disputes, reacting so injuriously upon every branch of industry, and causing a wide spread perturbation in the country.

In awarding due homage to the memory of the Cyfartha Iron King, and far from detracting from the merits of the Houghton-le-Spring coal magnate—"e fungis nati homines"—there are many men, of similar humble parentage and training, endowed with equal perspicuity of character amongst the mining population of this country.

I propose to prove that the moment has arrived for the miners to have transferred to them the entire exploitation of the coal mines in Great Britain, allowing the coalowners as a starting point a fixed minimum dividend upon an equitable valuation of their property, comprising a redemption fund. For the present state of affairs, with no prospect of improvement as far as the actually invested capital is concerned, the coalowners are alone responsible, their insane conduct in running up prices a few years ago to upwards of 300 per cent, inducing untold capital to be invested in coal extraction, in numerous instances entailing awful loss, and reacting on the entire trade, which otherwise would never have found its way into that channel, resulting in an immensely increased output, causing an internecine coal warfare and a competition a *l'outrance* in France, Germany, Russia, Spain, India, and Australia, not forgetting the United States of America and Canada, of indigenous coal with other coal and lignite fields in course of more active development in Japan, Turkey, Austria, &c.

The entirety of the carboniferous deposits in Great Britain is valueless bereft of the manipulation of the pitman, who hews and brings the black diamond to bank.

The engineers' and masons' strikes have demonstrated the futile attempt of importing foreign labour. The number of foreign seamen in sailing and steam vessels of the United Kingdom was, as compared with British, in 1878 13.55 per cent., having risen from 4.2 in 1851, the rate of wages, being in 1848 55s. a month, and in 1878, thirty years later, 55s. to 60s. to the Mediterranean from the Tyne, showing that the introduction of foreign labour in no manner diminished the cost. The royalties must undergo a partial revision; the capital invested must be equitably valued, and as regards, in the first instance, the Yorkshire coal output, an assured saving of a minimum of 5s. a ton on railway carriage and attendant expenses from pit mouth to metropolitan consumers' premises will be an immense boon to the new regime, severed from all railway influence, which is the cause of the so-called inland colliery owner's working their valuable mineral deposits at a loss, the coal hewers wages reduced, and their families impoverished, simply by paying an exorbitant rate of carriage by railway to the Metropolis in lieu of the legitimate seaborne route. The Miners' Association of Great Britain will be enabled to ensure to every member constant work at an enhanced rate of wages, or an immunity from the results of the actual state they are reduced to. The royalty owners will levy an equitable tax, the coalowners will receive a satisfactory return upon their adjusted outlay, and the present constantly recurring unfortunate state of affairs will cease. Capital is assured to carry out this proposal.

Although the darkest blot upon modern civilisation is absence of sympathy in human nature—so characteristic of our time—the present "demarche" is by no means to be interpreted as an unauthorised or "extreme" appeal on behalf of the miners; but as glory is a shadow, and genius (of which it is the only recompense) is but a mournful gift to its possessor, and if for all their risk run in the bowels of the earth, for the *embarras de richesses* they have heaped upon numerous coalowners, the miners have to be deemed to look forward to a repetition of the latter years' proceedings, they will carry public opinion in their favour in the course proposed. In a matter of such vast importance I submit the present as a sovereign panacea, having boldly but humbly stepped into the breach as a



practical man, having for upwards of 25 years been Russian Consul for North and South Shields and district, within the precincts of which towns (the seaports of the Tyne, where the coal is shipped) more coal is exported than from any other district in Great Britain, as having exported coal from the north-eastern ports, the Friths of Forth and Clyde, the Humber, and South Wales, travelled all over Europe in the coal trade, favoured by being able to converse and correspond in the various idioms (for the greater part learned in my youth at school) in the respective countries. I am compelled to be thus minute to show that I am no stranger to the subject technically, financially, and commercially in all its bearings.

Little Tower street, May 20. WILLIAM JOSEPH THOMPSON.

#### THE NEWCASTLE COAL FIELD:

IS THERE COAL UNDER THE CLEVELAND IRONSTONE?

SIR.—The Northumberland and Durham coal field commences about Amble, in the former county, and extends southward in the latter to Bishop Auckland. It is partly overlaid by the Magnesian Limestone series which crops up about Hartlepool. The Coal measures do not lie conformably with the Magnesian Limestone, but crop up against it, as also do the Carboniferous Limestone measures; so that at one point the Mountain Limestone, I believe, comes up to the Magnesian Limestone, and to the New Red Sandstone, which goes southward by Stockton until it is covered by the Lias and Oolitic series. The New Red Sandstone comes in again at York, and we see no Coal measures until Leeds is reached. Now, the question is, at what point do these Coal measures come in under the New Red Sandstone? If we suppose it to be as far on the south side of the point where the Carboniferous Limestone touches the Magnesian series, then it is possible that at Northallerton the Coal measures should be found at no great depth. Have there been any bore or other observations made upon this point?

AN ENGINEER.

#### ELECTRIC SIGNALING IN MINES.

SIR.—Although I do not for a moment doubt the efficiency of a telephonic signal in underground use, I scarcely think that the telephone as the instrument likely to be useful in collieries. The fact is that the number of signals we have to send from surface to the pit bottom are so few, being practically limited to "go on," "stop," "men in cage," and one or two others, that were the telephone substituted for the bell we could only give the same orders less simply. But apart from simplicity the bell has an advantage the importance of which cannot be overestimated. A message through the telephone is only audible to the person receiving it, and not always intelligible to him, for it requires, I can assure you, a considerable amount of practice to keep up a conversation through the telephone, owing to the sounds, as I suppose, becoming confused or intermixed. With the bell it is quite another matter; not only is the signal audible, but it is audible to everyone within 50 yards of it, so that in case of dispute—though this never arises in practice—as to the signal given there would be plenty of witnesses to facilitate fixing the blame on the proper person.

As to the proposition to establish communication with the working places, which I understand your correspondent to make, very few would consider it at all necessary; but assuming it to be so, the use of the telephone would be more objectionable than in communicating down the shaft. It could scarcely be necessary to send any other signal than a danger warning to the men at the faces, and for this purpose nothing would be so reliable and audible as the bell. A single bell would do the work of a dozen telephones, and would not cost one-tenth the price to fit up and keep in order.

Tynemouth, May 20.

COLLIERY ENGINEER.

#### NOTES ON MR. HOLLWAY'S PROCESS FOR THE UTILISATION OF SULPHIDES.

SIR.—I wish to add some notes on the mechanical side of this subject, although these may, perhaps, be affected by the chemical necessities of the case.

It seems of the utmost importance to economise the fuel used for blast purposes in this process, especially where water power may be scarce and fuel expensive abroad, and any such saving will enable even poorer ores than now to be profitably worked. Therefore, the air-blast pressure should be kept down to the minimum chemically necessary. For each pound of pressure per square inch of air-blast saved would at the Rio Tinto Mine, in Spain, be equivalent to a saving of 1400*l.* a year in coals, besides some reduction in first cost of engines and boilers. And in order to keep down the air-blast pressure as much as possible, the depth of the molten material in the furnace or converter hearths must be as small as possible, since each 6 in. depth of molten bath requires about 1 lb. additional air-blast pressure per square inch.

Economy in air-blast will probably be effected (as proposed by Mr. Hollway) by first melting the pyrites ores and fluxes in suitably shaped blast furnaces, and then continuing the blowing of the molten portion as much as necessary in separate vessels, afterwards allowing the heavier regulus to subside, and the lighter slag to be drawn off in other further vessels, of course with provision for condensing and collecting the sulphur, acids, and other valuable volatiles products. A lower blast pressure also reduces the temperature of the furnace, and thus conduces to the durability of the lining, which is so difficult and expensive to maintain. The best shape for the blast furnaces should be carefully experimented on, so as to ease the blast by carrying all the unmetallised burthen of ore and flux on sloping sides of the furnace, for which purpose it is not certain that a circular section is the best. The position, direction, and inclination, number and size of the tuyere openings should also be experimented on, to attain the best results; for if the air can be blown down into the molten mass it need not have so great a pressure as if introduced from below, where it has to overcome the resistance or pressure due to the depth of the molten bath, where the chemical action is so rapid that the blast probably ceases to be air a few inches from the tuyere mouths, and this is an additional reason for reducing the depth of molten material of bath to the minimum possible.

The pyrites ore and flux should not be broken too finely, or else the unmetallised burthen will fall in a mass on to the molten portion, and so necessitate increased blast pressure, and if the lower part of contents of furnace should ever get into a pasty, sticky, or choked condition, then the gases evolved, which ought to pass up through and heat the burthen, would be dangerously confined; in which case safety-valves, with openings at different levels, might be necessary to let off these gases, whose presence, if unrelieved, might otherwise increase dangerously. Such safety valves must be placed at a proper distance from the heat of the furnace, and must be of a material which will withstand the corrosion of the hot sulphurous acid gases. If the air blast can be heated in the blast furnaces themselves, then the blast pipes must also be constructed of some durable material, or else protected by brickwork against the heat and corrosion.

The operation of the blast, &c., would also be facilitated by making the slag of a light specific gravity as the fluxes will permit.

The heat from the slag should be utilised in heating the air-blast, in cases where the slag is not otherwise made use of, though slag such as Mr. Hollway's, which contains over 50 per cent. of iron, will in some countries well repay working, whilst hot, to extract this iron. But if the slag be run direct from the furnace into shallow iron trucks lined with fire-brick, earth, sand, or other suitable material, and if these trucks be run into a closed chamber, gallery, or tunnel of brick or earthwork (with double doors at each end for the retention of the heat and for excluding the outer air) then the air in the blast-pipes would be considerably heated if such pipes were placed just over the trucks in this chamber, and if the air in them was passed backwards and forwards in them until sufficiently hot. If sufficient heat cannot be thus obtained for the blast, then its heating might be completed by utilising the waste heat of the blast furnaces. This system might be easily adopted at any iron or metal works where there is a supply of hot slag or of other hot materials (such as large castings or forgings) by the use of some such chamber, as all such heat, whilst cooling, is at present wasted.

If it should be desired to cast the hot slag into bricks, tiles, paving slabs, or other articles in moulds, this could be done on the trucks,

which would then be put to cool in the closed chamber, where the air-blast (or the feed water for boilers also) is to be heated. Of course, when cool, these trucks are run out, and others, with fresh hot slag, are introduced into the chamber.

The trucks should be shallow, so as to give as much heating surface as possible, and their sides may be slanted, so as to facilitate tipping out the cold slag. The dimensions of the chamber will depend on the pipes that can be placed in it, and on the number of trucks of hot slag used to attain the required temperature, but it should be of a shape to just hold a considerable number of trucks on the line of rail.

Another method of utilising the waste heat of the slag would be to run it out of the furnace direct into water, which could be thus heated sufficiently for use in the steam-boilers, if it could be filtered properly from the dirt, &c., dissolved from the slag, which would be thus granulated.

Any such application and use of slag heat depends very much on the use (if any) to be made of the slag afterwards. This may, in turn, depend on questions of cost of fuel and of carriage to market of the articles thus producible from it, such as cements, bricks, silicate-cotton, &c.

Although only part of its heat may prove available, since slag is a bad conductor or radiator of heat, yet all such easy economies are worth consideration, where large industries are concerned, now that competition is so close, prices so low, and trade so depressed. And the only trouble and expense involved in such trial would be in the construction and working of the closed chamber, for which some existing building might possibly be made available.

Where there is water-power at hand, then the profits of such processes as Mr. Hollway's will be further increased, though such profits depend chiefly on the richness of the ores used on variable local circumstances, which affect working conditions, and also on the fluctuations in market prices of the metals, the sulphur, and the acids thus produced. A spare engine and boiler will probably prove useful in case of break-downs, and also to enable the blast to be varied, to suit changes of ore, &c.; and the best arrangements for putting the furnaces easily in and out of work, for repair, will be to place them in a circle with a central flue, to which their blast and gas pipes converge. They should also, where possible, be placed in a hollow, or near to a high bank, so as to save the cost of lifting all materials into them.

WALTER T. SHUTE, C.E.

#### WINDMILL POWER IN MINING.

SIR.—Allow me to correct a slight error made by your ubiquitous Correspondent in North Wales in his last letter. He assigns to me the credit of having constructed the windmill used for pumping at the Mona Mine in Anglesey. I merely proposed the erection of the mill, and had retired from the management of the mines before the work was undertaken. The suggestion was carried out by my friend and former assistant Capt. Wm. Hughes, the present manager of the mines, to whose skill and untiring perseverance the company owe the fine windmill which drains their mines, and the excellent system of wooden pumps to which it is attached. The idea first occurred to me on reading in *Records of Mining*, by Phillips and Darlington, page 28:—"In 1708 windmills were erected to work pumps in several collieries in Scotland; but being ineffective in calm weather their application was very limited."

If I am rightly informed, a windmill was employed some years ago to work an ore crusher at a mine in Flintshire, and, strange to say, a recently discovered map of the Mona Mine, dated 1785, shows a windmill near the very spot where the present mill stands. When travelling in the Isle of Man, some time ago, I saw a small one working some slate-dressing machinery.

Your Correspondent will thus perceive that the idea is not altogether so novel as may generally be supposed, but his suggestion that wind-power should be more extensively used in mines is one well worthy of the consideration of all interested in mining industry. It might in a great many instances be employed as a very economical substitute for steam. If your Correspondent, or any other brother miner, would like to see the mill at Mona Mine, I shall be very happy to give him a note of introduction to Capt. Hughes.

Mona Lodge, Amluch, Anglesey, May 18. T. FANNING EVANS,  
H.M.'s Inspector of Mines.

#### ENAMELLED METAL ROOFING.

SIR.—It was some time since suggested that ornamented enamelled iron plates should be substituted for slates for roofing purposes, and I believe that the difficulty of fixing them was almost the only thing that prevented their general adoption. This difficulty has now been entirely removed by Mr. Needham Chippendale, of Ilkeby, who has recently been using some metallic purlins, which appear to exactly meet the case. He arranges the purlins so that they can be used for roofs pitched at any angle, whilst the sheets of metal can be readily secured to them. He forms the purlins of thin sheets of metal, which are bent in such a manner that a flange is formed on one side, which he calls the top side of the purlin; this flange, when the purlin is fixed in position, is next to the metal that is employed to cover or divide the structure; the other or bottom part of the purlin is curved and formed hollow in section. The purlins are made in convenient lengths, and to connect them together a short length of each purlin at one end is made without the flange, and the bottom or curved portion is a little less in section than the remainder of the purlin; this reduced portion is of such a size that it will slide and fit tight into the larger end of the purlins, and thus he is enabled to extend the same to any length of building.

In order to secure the plates to the purlins he forms a groove on one side of each purlin between the flange and the curved portion of the purlin; into this groove he places one end of the plate used to cover the structure; this plate rests in the groove and extends over the space between the purlins to the next purlin, which it covers, and is held in position by metallic clips, which clip the purlin flange and the bottom. These ornamented enamelled plates make very handsome roofs, and are, perhaps, the most economic and durable that can be used.—Cardiff, May 20.

IRON.

#### THE THARSIS COMPANY, AND HUELVA COMPANY.

SIR.—I am obliged to Messrs. Haselden and Gosse's solicitors for their courteous invitation to attend the hearing of their case against the Tharsis in Paris on Monday last. Unfortunately I could not get over, but I have to request they will give publicity in English and Scotch papers to the trial. As one is allowed to prophecy in the Derby week I will try my hand at a prediction of the result of the trial, and you will be able to tell me on Saturday how far I am right.—1. The Court will decline to pronounce any decision against the Tharsis in respect they have no jurisdiction without consent.—2. They will take up the question of the relevancy of the action against the Huelva Company; that is to say, they will decide whether the conclusions of the action logically follow from the averments, and they will decide against the relevancy for this reason—that non-payment of part of the price cannot be a ground for invalidating the sale after the vendee has been allowed to exercise proprietary powers, and transact with third parties. In such circumstances the vendor is merely creditor for the balance of the price, and can only sue for it as an ordinary debt. If this is not French law, and if the action by that law is relevant, the Court will order the plaintiffs to prove their averments.—3. If the action is relevant, and the averments are proved, the next proceeding will be before the Courts in Spain to reject the Tharsis Company, and the first thing these Courts will do will be to sequester the property, and carry on the works under official control for the benefit of the party ultimately found in the right.—4. If the action is found irrelevant and dismissed there is nothing to prevent the plaintiffs bringing a new action, and in that case I recommend they should bring it in the Scotch Courts both against the Huelva Company and the Tharsis Company. The Scotch Courts can secure jurisdiction over the Huelva Company by arresting in the first instance their property situated in Scotland—23,000 paid up shares of the Tharsis Company. In conclusion, I have to correct another mistake as to myself. I am not a Glasgow but an Edinburgh lawyer, and so far from being the lawyer of the company my firm would have no objections to act for

Haselden and Gosse whenever they are compelled to adopt what I have all along held to be their only competent procedure—an action against the Tharsis Company as assignees of the Huelva Company; such action be brought in the Court of Session. A LAWYER.

P.S.—The Tharsis Company, besides undertaking liability for the expenses of actions, expressly underlook liability for the actions themselves, and it is now plain they knew of the claims in the present action, and whatever they are they undertook to relieve the Huelva Company of them.

#### CHONTALES MINING COMPANY.

SIR.—An extraordinary meeting is called in connection with this company for Wednesday in consequence of the debentures not all been taken up; is it because the shareholders have not sufficient confidence in those who have the management? The directors and the secretary have received for their services nearly 4000*l.* At the half-yearly meeting held in London last week I addressed the meeting on different matters, and wished to have gone into the circumstances which had placed us in our present position. The Chairman objected, considering I had occupied a fair share of the time of the meeting. The machinery, stores, &c., ordered August 9, 1877, which were not delivered at Greytown until the following March, and some months later at the mines, the consequence of which is to be attributed to our present financial position. The Tuckingmill Company would have undertaken to execute and deliver an order at Southampton for 36 stamps in 14 days, whereas the order given by the directors was not finally completed for the 36 stamps until November. What is the consequence? If reference is made to Mr. White's returns for September to July, 1878, 3632 tons averaging about 600 tons a month were crushed, and the losses in consequence were 1230*l.*, whereas our profits should have been in accordance with the six following months returns 1978*l.*, showing the probable loss of 3208*l.* arising from the delay in March of machinery, stores, &c. We have no satisfactory information from the West India Mail Packet Company, or from our agents at Greytown, supplied by our directors for the delay. The gold that has been produced, 22,478 ozs., is valued at 61,338*l.* up to July, 1878. The reports from each of our managers that the gold is practically inexhaustible, the natural advantages in connection with the property are such that the mines properly worked, orders duly given and executed without delay, I have not the least doubt but what the statement made by Mr. White to me in one of his letters that after he had carried out the dead works of repairs he had every confidence that the Chontales would be a permanent paying dividend mine. The directors of the Chontales Company seem to pride themselves in having subscribed their proportion of the debentures, which amounts to about the money they have received as directors. The Javali Company, their directors have not received up to the present time any consideration for their services, and what is more, one of the directors found 10,000*l.* when an emergency arose.

Bristol, May 22.

WILLIAM BALL PALMER.

#### CANADIAN MINING NOTES.

SIR.—The resolutions which were proposed last night in the House of Commons, at Ottawa, by the Hon. Dr. Tupper will be the basis for the encouragement and employment of a greater amount of industry than perhaps any scheme yet proposed in the world. I have in former letters advocated the tilling of the Queen's Farm. Mr. Jenkins once wrote a book styled the "Queen's Head," but if he had kept his attention turned to the Dominion he was employed to represent he would, perhaps, have been able to have written a book on the Queen's Farm. Now, the reader may not know where the Queen's Farm is. Well, it is situated in British North America. It begins at the eastern limit of Manitoba, and extends to the Rocky Mountains. On the south it is bounded by the territory of the United States, and unlimited towards the north—as Canada reaches to the North Pole. Probably the fertile land may be said to lie between latitudes 49 and 55, although the Peace River Valley, under the foot hills of the Rocky Mountains, is said to be a region of great fertility. Her Majesty being possessed of such a vast stretch of fertile land, and her subjects in England being at the present time almost in a starving condition on account of want of work, it is proposed to take steps to work the Queen's Farm. But the tenants will be tenants in fee simple absolute—not tenants for years, or tenants for life, or tenants in tail. The building of the Pacific Railway is the present object, but the building of a Great National Dependency, having Her Majesty the Queen of England as its head, is the ulterior object. The following are the resolutions:—

#### CANADA PACIFIC RESOLUTIONS.

Hon. Dr. Tupper has given notice that he will move the House into Committee of the Whole to consider the following resolutions with respect to the Canadian Pacific Railway:—

- Resolved,—That engagements have been entered into with British Columbia as a condition of union with Canada, that a line of railway to connect the Atlantic with the Pacific shall be constructed with all practical speed.
- Resolved,—That the Pacific Railway would form a great imperial highway across the continent of America entirely on British soil and would provide a new and important route from England to Australia, to India and to all the dependencies of Great Britain in the Pacific; as also to China and Japan.
- Resolved,—That reports from the Mother Country set forth an unprecedented state of enforced idleness of the working classes, and the possibility of a scheme of relief on a large scale being found indispensable to alleviate the destitution.
- Resolved,—That the construction of the Pacific Railway would afford immediate employment to numbers of workmen, and would open up vast tracts of fertile land for occupation, and thus would form a ready outlet for the over-populated districts of Great Britain and other European countries.
- Resolved,—That it is obvious that it would be of general advantage to find an outlet for the redundant population of the Mother Country within the Empire, and thus build up flourishing colonies on British soil instead of directing a stream of immigration from England to foreign countries.
- Resolved,—That in view of the importance of keeping good faith with British Columbia, and completing the construction of the Confederation of the provinces in British North America, and for the purpose of extending relief to the unemployed working classes of Great Britain and affording them permanent homes on British soil; and in view of the national character of the undertaking, the Government of Canada is authorised and directed to use its best efforts to secure the co-operation of the Imperial Government in this great undertaking, and obtain further aid by guarantee or otherwise in the construction of this great national work.
- Resolved,—That it is further expedient to provide (1) that one hundred million acres of land and all the minerals they contain be appropriated for the purposes of constructing the Canadian Pacific Railway. (2) That the land be vested in commissioners to be specially appointed, and that the Imperial Government be represented on the Commission. (3) That all the ungranted land within 20 miles of the line of the Canadian Pacific Railway belonging to the Dominion be vested in such Commission; and that when the lands along the line of the Canadian Pacific Railway are not of fair average quality for settlement, a corresponding quantity of lands of fair average quality shall be appropriated in other parts of the country, to the extent in all of 100,000,000 of acres. (4) That said Commissioners be authorised to sell from time to time any portions of such land at a price to be fixed by the Governor-in-Council on their recommendation, at the rate of not less than 2*l.* per acre; and that they be required to invest the proceeds of such sales in Canadian Government securities to be held exclusively for the purpose of defraying the cost of the construction of the Canadian Pacific Railway.
- Resolved,—That the withdrawal for sale and settlement of lands for twenty miles on each side of the located line of the Pacific Railway, has in part had the effect of throwing settlements south and west of Lake Manitoba.
- Resolved,—That in the existing state of things it is desirable to combine the promotion of colonisation with railway construction on the Canada Pacific Railway west of Red River.
- Resolved,—That the Government be authorised and directed to locate a portion of the railway system of the country from the Red River westward, running to the south of Lake Manitoba, with a branch to Winnipeg; and if they deem it advisable, to enter into a contract for expending a sum not exceeding 1,000,000*l.* in constructing the said railway without previously submitting the contracts to Parliament.
- Resolved,—That it is expedient to make further explorations in the Peace and Pine River Districts and other sections of the country not yet examined in order to ascertain the feasibility of a line through the largest extent of fertile territory, before beginning the work of construction in British Columbia.
- Resolved,—That in the opinion of the House the selection of the Burrard Inlet terminus was premature.
- Resolved,—That it is necessary to keep good faith with British Columbia and commence the construction of the railway in that province as early as is possible.
- Resolved,—That the Government be authorised and directed to make such further explorations as they may deem necessary for the said purpose, and as soon as they have finally selected and located the line, to enter into contracts for constructing a portion of the same, not exceeding 125 miles, without the further sanction of Parliament, so that the work of construction may at latest be commenced during the present session, and thereafter be vigorously prosecuted.

These resolutions cover nearly the whole ground, but when they come up for discussion in the House questions may be raised. There appears to be no reason why the Government should confine itself to 125 miles of road for the present season. The Union Pacific and Central Pacific were finished in six years, running through a country from Eureka West, sparsely settled at that time. It seems to be a wonder if the Canadians, with English men and English money, cannot put a railway across the Queen's Farm in as short a time as



the Yankees. Hanlon, a Canadian from Toronto, has beaten all the Yankee scullers, and why the Canadians cannot build a railway as quick as the Yankees is a question, which for the honour of Canada ought to be settled in the affirmative.

You will perceive the method which the Minister of Public Works has adopted, and it is one which has been found to be correct in theory and in practice. One hundred millions of dollars are obtained on the security of one hundred millions of acres of land, which cannot be sold at less than \$2 an acre. This plan was adopted, or a similar one, by the Illinois Central, and that the security is ample one has only to look at the statistics of the Canada Company; that company got its land for 70 cents an acre; it has sold three-fourths of it, has paid the principal and interest and bonuses, and the one-fourth it has left, although the worst land of the purchase, is worth as much as the company paid for the whole. This arose from the increase of the value of land. As it was in Ontario so it will be in the North-West. But the Government do not pay anything for the land (so save 70 cents an acre), and the Canada Company do not sell their land now for less than \$5 an acre; yet if the Government or Commissioners sell their land for \$2 an acre they will have \$100,000,000 more than is wanted to build the Pacific Railway. Thank Heaven we have got a good Government at last, and the reign of those Scotch grits is over.

A great explosion of dynamite occurred at the Stratford Station of the Grand Trunk Railway this week. The investigation is now going on, and probably the whole fault arises from the desire on the part of the makers to sell cheap. Mr. C. A. Dunbar, of Aurbertsbergh, ordered the powder from the Hamilton Powder Company, and it was to cost 30 cents (about 1s. 3d. sterling) a pound delivered. I shall write more fully with regard to it next week.

Toronto, May 8.

BOURNONITE.

## LEAD MINES IN FRANCE.

Sir,—“Tis a pity when charming women talk of things that they don't understand;” so says the old song. ‘Tis equally a pity when Frenchmen give their opinions on mining matters. A man may be born in Cornwall, but he would be a bold Cornishman who said he knew all the mines in that county! and as for any man being able to purchase all the mines in the Pyrenees for a few thousands, the statement is simply a ridiculous one. In the last eight years the railway from Toulouse to Bordeaux has constructed branches to Foix, St. Girons, and Luchin, which has reduced the cost of carriage to Marseilles and Bordeaux to about 14s. per ton. The cost of labour is considerably below that of English labour, and the statement that the mines in the Pyrenees cannot be worked in the winter is disproved by the fact that the Sentein Mine (which is situated at 6000 feet above the sea level, and has had 30 feet of snow at surface since the first week of October) has been worked by two Cornishmen, with 30 or 40 Frenchmen under their direction, during the whole of this extraordinary severe winter, and have raised upwards of 2000 tons of splendid silver-lead, which is now coming to market. No doubt enormous sums of money have been expended by former owners in making roads up the mountain, and putting up machinery of the most elaborately expensive and useless character; all of which has been pulled out and replaced by Cornish machinery at a very small cost, sufficient to dress 40 tons of ore per day.

The native of Arriège had better go out and see before he writes any more rubbish. Why cry “Stinking fish” of his own birthplace? which contains some of the most magnificent deposits of ore in Europe. He seems, too, absolutely ignorant of the existence of gold there.—Pyrenees.

ARRIÈGE.

## THE PLYMPTON MINING AND ARSENIC COMPANY.

Sir,—I have been much interested in reading the report of the Plympton Arsenic Works in last week's Journal. I should feel much obliged if anybody connected with that company could kindly inform me, through the medium of your paper, how many tons of their mundaic it takes to produce 1 ton of soot; and what does the residue contain—Is it a tin residue, or a copper and silver residue? As the cost of raising mundaic must be very low, having regard to the shallowness of the mine, its favourable situation, and the applicability of water-power for the various operations connected therewith. I presume that the cost of raising each ton of mundaic must be very low, and must compare most favourably with other mundaic mines in the kingdom. Would it be possible, without wishing in any way to pry too deeply into the affairs of the company, to ascertain how much each ton of mundaic costs to raise? W. H. G.

May 21.

## IS IT RIGHT TO PAY ANY PURCHASE MONEY FOR MINES?

Sir,—It has escaped my notice until now that an error has crept into my letter published in the Journal of May 10. When referring in it to the letter of Mr. Johnson, published in the Journal of May 3, I find that in the original draft of my letter I said—“Now, this general mode of putting is very strange as coming from Mr. William Johnson, because I do not know of any such person having previously entered into this discussion; consequently, I could not have put any questions to him about the iron mine, and, therefore, it is extremely absurd for Mr. Johnson to say—‘With regard to the iron mine I cannot give the details he (meaning myself) asks for.’ I have compared the figures Mr. Johnson gives with what he professes to give in a letter written by him of Nov. 30, 1873,” &c. That is what I intended to say, and what I believe was written in my copy letter to the Mining Journal, but in the printed letter of the same date I am made to say “I have compared the figures he asks for,” which is an error, and injures the sense and connection of my letter. If I wrote those words in my copy letter which was sent to the Mining Journal it was a mistake, and I have to apologise, but if only a printer's error the matter is easily set right. It is always my practice to write a draft letter, make a fair copy, and then compare the two before sending either for publication.

I have been waiting to see what excuse Mr. Erwen could set forth as a plea for his flagrant misquotation, as I previously pointed out, but no appearance has as yet been put in by him. I should regret to use unwarrantable expressions towards Mr. Salmon for many reasons, but if Mr. Erwen is a veritable being he should be left to fight his own battles, and extricate himself from any difficulties in which he may be placed. Mr. Salmon says “There are some points in Mr. Hoskold's letter I might refer to, but as they are so mixed up with an attack on Mr. Erwen, I must leave that gentleman to deal with them as he thinks best.” Now, if Mr. Salmon had reversed the order of this sentence, and said that Mr. Erwen had made an attack upon me, he would have been nearer the truth, and I must say if Mr. Salmon cannot discriminate better than this, it would be well if he were to, as he suggests, end his contributions.

In all my letters I have exhibited a friendly spirit towards Mr. Salmon, and he ought to have seen that I was prepared to back him up. My criticism upon his letters and enquiries were intended for no other purpose than to procure from him facts upon which I could have laid a foundation. He, however, contrived to misrepresent me, and the consequence was the particulars I asked for were not forthcoming. However, he has given sufficient figures already to convince me whether or not he understands how a mine should be valued, and I have shown in my letter, published in the Journal of May 10, that he was in some respects in error. I will not comment further before he has set his discrepancies right. I am not disposed to discuss this matter merely from a spirit of contention, but because I am fully aware that some things have been asserted by some of your correspondents upon it which have no foundation in truth.

One correspondent says that “Mr. Salmon has the best of it.” Best of what, pray? I am of opinion that my first letter has not yet been thoroughly understood. If it had been no one could place me on the side of those who say it is not right to pay a purchase money for mines. A mine may or may not be worth purchase money, but no amount of mere discussion, embodying nothing but words, can determine it. It is my intention to write a few more letters upon the subject, and then my ideas will become more apparent. Meanwhile, I call upon Mr. Erwen to set himself right, and upon Mr. Johnson to clear up the anomaly which his letter contains. Last week Mr. Salmon treated us to a letter on the subject, “Should our Mining Population become Shareholders in Mines?” and in the

Journal of May 17 there is, as I take it, a reply by Mr. Robert Knapp. It is a sensible letter of a practical kind, and in a great measure I endorse the sentiments he has expressed. I think if every correspondent were to deal with the subjects they take up in the same candid and thoughtful manner we should not have so much balancing of straws and cavilling.

H. D. HOSKOLD.

Madrid, Spain, May 19

## MEDLYN MOOR MINE.

Sir,—I have been expecting to see in the Journal from the agent's report that they have intersected the great north tin lode in the above mine, but I suppose, owing to the soft state of the strata, they have had great difficulties to contend with. I hear from good authority that a certain mine agent made a thorough inspection of this mine lately, and was very much surprised to see the manner that the timber used underground was fixed; he even went so far as to say he never in all his mining experience saw timber so well fixed. This, I should think, speaks well for the agents. Shareholders are generally content when they know their property is entrusted to well experienced agents. I happen to slightly know the present agent at the above-named mine, and also his late much respected father. I have often heard many gentlemen speak of him in the highest terms as a thorough good miner, one they could safely trust, and feel confident their property would be well worked and cared for. He seems to have stuck well to Wendron Mines, and I have not the slightest doubt he is and will be found greatly missing in the parish. I think I am not wrong in stating it is something like 24 years since he took an interest in mining in the locality, and from what I can learn he was the principal means of bringing something like 100,000l. in the district, Medlyn Moor being, I think, the last mine the late much respected Capt. James Rowe started prior to his death. I sincerely hope that the mine, for his friends and family's sake, will turn out a great success. I hear his son, the present agent of the Medlyn Moor, is about to form a company to work another mine in the district. I hope he will meet with the same support his late father always had in bringing out a new mine. I am sure everyone in the parish will wish him success in his undertaking.

P. M.

Redruth, May 22.

## CORNISH MINING—GWENNAP.

Sir,—The interesting remarks in last week's Journal on this district, and the recent discovery in Bell Vein property, should afford every encouragement to those interested in mining properties hereabouts, and ought to stimulate vigorous prosecution by Jordan's drill and cotton powder (or other suitable explosive cartridges) on the part of any management of mines adjacent, so as to determine with the least expenditure of time as possible what finds of tin and copper are possible in these dull times. I hope the management of Penstruthal may be able to see their way to avail themselves of the look out in their favour, as they are due (or about) west of the improvement already alluded to. They do not appear as yet to have been able to extricate themselves from the disastrous effects of the late management, but it may be hoped that under the new management (although small finds may be at its disposal) early and great discoveries, and subsequently large returns, may be made, and partially, it is hoped, restore the long lost activity of this naturally metalliferous locality.

READER.

## THE MINING INTERESTS OF GREAT BRITAIN.

Sir,—The English are an exceedingly credulous and self-complacent, though stubborn, people, and probably no phase in modern history demonstrates the facts more forcibly than the disputes between labour and capital. That the mining communities, “who necessarily are labourers, and by no means on a par with artisans and skilled mechanics,” should propose to coerce capital into submission to their demands through combined organisation to suspend operations for a time of all the collieries throughout Great Britain is simply a revolution, subversive of the independence of capital—i.e., *de facto*, the proposal is a total severance of all independence and control by the proprietors or their executives in the management of their own properties. Nothing more preposterous, absurd, and ruinous to the commonwealth could possibly have been conceived, far less attempted, to be carried into effect. The heavy and frequent suspensions, loss of capital, and in many cases bankruptcy in the iron and manufacturing trades, all fail to strike a warning note or to produce a single salutary effect on the minds of misled, uneducated, and self-sufficient masses of working colliers. The fact is that self-interested and self-constituted demagogues, coupled with wilfully infatuated Jesuits propagating false economical doctrines, have deluded the workmen, while the stubborn obstinacy of the Saxon keeps them in subjection to their leaders and true to their Unions; thus the thrifty suffer through the overwhelming influence of the misguided majority. It is all very well for Mr. Gladstone to bluster about our foreign policy and its direful effects, but it cannot be too forcibly instilled on the minds of the public that the acts of the ex-Premier who fostered the fierce game of competition that culminated at its height in the years 1872 and 1873, when prices of products and manufactures were advancing with strides and leaps, irrespective of healthy progress, that it is to his requiem alone that we must date the advance of strikes and lock-outs with the sad crippling depression in trade and manufactures, so protracted and now prevailing.

It is most gratifying to observe the progress made in the manufacture of steel through the practical utilisation of phosphoric iron ores produced in the Cleveland district. This important discovery will prove an exceptional element in the future industries of our iron productions, for it is now ascertained, and beyond question, that we can produce steel at prices and in quantities to defy competition from all other countries throughout the known world.

Seven years ago Dolcoath gave about 48,000l. in dividends, and so recently as six years about the same; still the mine is more productive and yields more tin ore at present than in either of the years referred to, yet the dividends are only 5s. quarterly, or (say) 4296l. annually. There is no falling off in the production, but, on the contrary, considerable addition, and should the price of metallic tin advance to the standard of 1872-3, there can be no question that dividends of 50,000l. annually could easily be declared. Manufacture, trade, and merchandise do not suffer more than mining, and it is only fair to anticipate that each and all will revive together.

While on the subject of tin, we may refer with satisfaction to the substantial dividends declared by South Frances, Wheal Peavor, and South Condurow. It is greatly to be regretted that these rich and well-conducted mines should have to realise such large products to produce the profits referred to, satisfactory as they prove, regarding the times of depression through which we are now passing.

Copper mines in the west peninsula are themes of past remembrance, for even South Caradon made profits over thirteen months of 14l. 19s. 3d. only, hence the dividend of 512d. declared in November last was not earned from profits. The credit balance still in hand is 2706l. 1s. 3d. The capital called up was only 640l.; hence the dividends extending over a period of 40 to 45 years, amounting to 381,184l., with an addition of 2066l. 1s. 3d. added to the paid-up capital. These results sprung only from excess of products over costs of production. West Seton, Mellanear, and West Tolgus are the next most important copper mines in the West of England.

The lead mines of Great Britain have of late years proved most prosperous and remunerative to investors, and returned more dividends than any other description of mining enterprise:—

Market value.	Mine.	Shares.	Paid.	Dividends.
£240,000	East Darren	300	£ 32	£ 235
32,000	Great Laxey	15,000	4	24
60,000	Green Hurth	6,400	6s.	2 1-10
—	Grogwinth	20,000	2	14s. 10d.
12,000	Ile of Man	2,500	25	82
90,000	Lisburne	400	18s.	597
65,000	Minera	9,000	5	68 1-16
105,000	North Hendre	10,289	2	21
35,000	Roman Gravel	12,000	7	8
257,000	Tankerville	12,000	6	87s.
7,000	Van	15,000	4	23
—	West Chiverton	3,000	15	55

The above twelve mines have yielded the large sum of 2,167,187l.

in dividends on an outlay of 416,892l.\* At present these mines command a market value of 922,000l. These figures prove that lead mining is a most profitable investment. These companies refer more to the past than the present or the future, hence we beg to enumerate the following progressive mines as possessing the true elements of success, while with moderate patience and very moderate outlay equal success is fairly foreshadowed. There are, of course, varied differences in their respective merits and market value, which alone can be explained by experts and practical authorities. We, however, submit our selection with confidence:—Pateley Bridge, West Pateley Bridge, Lead Era—one of the coming early prizes—Bodidris, Bwlch United, Cwm Brwyno, Rhydalun, Monydd Gorddu, Talybont—reported discoveries exceptionally good, Temple, Truro.

R. TRIDINICK.

Consulting Mining Engineer, Proprietor and Promoter of Mine Companies, and Dealer in Stocks and Shares.

Cornhill, May 20.

[ADVERTISEMENT.]

## THE STRIKE AT GREAT LAXEY MINES.

Sir,—I enclose you a copy of letter to be published by me in the *Manx Sun* and the *Manx Times* of Saturday next. Please also insert same, together with this letter, in your Journal at the earliest possible opportunity.

Douglas, Isle of Man, May 15.

JOHN HARDY.

## GREAT LAXEY STRIKE.

Sir,—In the Isle of Man Times of last week a letter appeared with the heading “The Great Laxey Strike—Who is to Win?” and signed with the initials “J. H.” The letter in question contained statements in reference to the directors and managers and other persons connected with the Great Laxey Mining Company (Limited) which are totally unwarranted and unjustifiable. I beg now publicly to acknowledge that I am the author of the said letter, and to express my deep regret for having written the same. I had been down at Laxey on May 2, the old day, and witnessed the distress prevalent in consequence of the strike. I have, however, since felt convinced that I took an utterly one-sided and unreasoning view of the case, and that, carried away by my feelings of compassion for the men, I was foolishly and unreasonably led into making the unfounded statements, and using the inexcusable and violent language contained in my letter. I find that I have attributed blame entirely to the wrong persons, and that I had no foundation whatever for the statements which were, I am sorry to say, made by me in sheer recklessness, and without any enquiry, and I now find that they were as untrue as they were violent, although they were made by me from a good motive—the idea of aiding the cause of persons who, I erroneously believed, were oppressed. I can now only make the best reparation in my power, and apologise most sincerely for my conduct.—Douglas, May 15.

JOHN HARDY.

[For remainder of Original Correspondence, see to-day's Journal.]

## THE SCOTCH MINING SHARE MARKET—WEEKLY REPORT AND LIST OF PRICES.

During the past week prices generally have continued to improve, though latterly business has been quieter on the approach of the settlement being hastened by some holidays. The favourable tendency may be ascribed to the cheapness of money, and confirmation of a treaty of peace being settled with Afghanistan. There is also a more hopeful feeling regarding the course of trade, and it is very satisfactory to observe that the latest returns of foreign commerce from the United States show an increase in imports and a decrease in exports, indications that the purchasing power of that country is increasing, and bound to have a good effect on our markets.

In shares of coal and iron companies Bolckow, Vaughan, & Co. have declined 1l. per share, Clyde Coal 14s., Lochore and Caplehead 7s. 6d., Ebbw Vale and Glasgow Port 20s. 6d. Benhar has been firm from 28s. to 30s. all the week, being a slight improvement, owing to the company's request for the recall of the provisional liquidator, appointed some time ago, being granted, and notice published that the coupons due on their debentures will be paid on presentation. The annual report of the Parkgate Company shows an available balance of 6834l., from which they recommend a further dividend of 1l. per share, making 2l. per share for the year, and carrying forward 854l. The Ebbw Vale Company are issuing mortgage debentures, bearing 5 per cent interest, for terms of not less than five years, to replace others falling due. Glasgow Coal Exchange shares continue in request. Andrew Knowles and Sons are at 11½d. Bolckow, Vaughan, and Co., at 59 to 60; ditto B, 34½; ditto Scott, 109; and ditto 5 per cent. pref., 19½. Cardiff and Swansea, 25s. Charles Cammell and Co., 20s. Chillingham, 40s. to 60s. Ebbw Vale, 50s. to 55s. Great Western, 40s. John Brown and Co., 20½d. Marbella, 25s. Muntz Metal 14½. Nant-y-Glo and Blaenau (pref.), 12 to 14. Newbarn, 7s. 6d. to 12s. 6d.; Meredydd, 25s.; North Buxy, 47s. 6d.; Prince Patrick, 20s. to 30s.; Penstruthal, 2s.; St. Harmon, 12s. 6d.; South Frances, 9; South Condurow, 11½; Van Consoles, 7s.; West Tolgus, 26; West Wye Valley, 14s. 6d.; West Asheton, 15s. to 20s.; West Chiverton, 40s.; Wheal Peavor, 9½; Wheal Kitty, 5s.; Wheal Uny, 6s. 3d.

In shares of foreign copper and lead companies, there is a decided improvement to be noted in the former. Rio Tinto 5 per cent. have advanced 3l. 12s. 6d. per share; ditto 7 per cent., 27s. 6d.; ditto shares, 10s.; Cape, 10s.; also Tharsis, old and new, each 8s. The principal dealings have been in the Rio Tinto securities and Tharsis shares. The latter, after selling at 21½, have come into demand at 22½. Cape are 27 to 28; Hornachos Silver-Lead, 9 to 10; New Quebec, 43s. 9d.; Rio Tinto 5 per cent. 73 to 75; ditto 7 per cent., 16½ to 17; Yorke Peninsula (Pref.), 10s. to 12s. 6d.

In shares of home mines business continues very quiet. Glasgow Caradon shares have been sold at 20s., showing an advance of 1s. The sale of copper ore by this company to-day is, computed, 190 tons, or same as last month's sale, but in the month of May for some years back the sales have been from 240 to 250 tons. Of course copper was then at a price that offered inducement to make larger sales than now. The bottom level at Gorse and Merilyn is reported to be worth 1½ to 2 tons per ton, and turning out well. Tin is going down, and tin shares, which are generally weaker, but several are now safe and good to buy. Tin pay a good rate of interest on capital at the present price of tin, and if tin improves, which it is sure to do, and perhaps very soon, they will pay a great rate of interest. Killfirth shares have been done at 7s. 6d., but are now at 5s.; it is said they have a fine lode in sinking the engine-shaft. North Buxy shares are good to buy. It is a small company in 888 shares, and the ore is sight, not to mention the plant, &c., is much more than the price represents. Aberdunant are at 2s.; Carn Brea, 30; Caron, 16s. 3d.; Combmartin, 4s.; Cook's Kitchen, 49s.; Dolcoath, 20s.; East Lovell, 20s.; Great Laxey, 15½; Glenary, 5s.; Herodfoot, 70s.; Llanvret, 7s. 6d. to 12s. 6d.; Meredydd, 25s.; North Buxy, 47s. 6d.; Prince Patrick, 20s. to 30s.; Penstruthal, 2s.; St. Harmon, 12s. 6d.; South Frances, 9; South Condurow, 11½; Van Consoles, 7s.; West Tolgus, 26; West Wye Valley, 14s. 6d.; West Asheton, 15s. to 20s.; West Chiverton, 40s.; Wheal Peavor, 9½; Wheal Kitty, 5s.; Wheal Uny, 6s. 3d.

In shares of gold and silver mines Richmonds are 5s. lower, after having been offered at 8½. This week's run is 800,000. Eberhardts are also easier, as the reports from the mines so far are not very favourable. Argentines are at 3s. 6d. Cedar Creek, 2s. 6d. Colorado, 8s. 6d. Don Pedro, 18s. Emma, 2s. 6d. Exchequer, 2s. 6d. to 5s. Flagstaff, 2s. 6d. to 5s. Port Phillip, 9s. St. John del Rey, 27s. Santa Barbara, 35s. 6d. to 40s. 6d. Sierra Buttes, 42s. 6d. South Aurora, 2s. 6d. to 5s.

In shares of oil companies, Broxburn have improved 5s. per share, and Uphalls are 3s. 9d. lower. Uphall (B) shares are required for. The principal dealings in this department have been in Young's Paraffin, which fell to 13½ on the dividend announcement, but quickly advanced to 14½ on “bear” purchases, and now stand at 13½ to 14, or about 8s. 9d. per share higher for the week. The dividend the directors have resolved to recommend is at 12½ per cent., after deducting the usual depreciation, and carrying forward 2735l. Last year 17½ per cent. was paid, and 2629l. carried forward, but the shares were then selling at 15½ to 16.

Shares of miscellaneous companies neglected. Earle's Shipbuilding are at 24 dis. Native Guano, 45s. In wagon companies shares Scottish have been done at 8½ and 9, or an advance of 1l. 10s. per share, and an advance of 10s. is offered for the new issue at 3. Prices of others are:—Birmingham, 12½; Bristol and South Wales, 6½; Gloucester, 6½; Metropolitan, 80s. prem.; Midland & Railway Carriage, 80s.; and Swansea, 40s. In chemical companies shares there is some demand for Lawes' ordinary and preference, but the others are about late prices. Langdale's, 75s. to 80s.; Lawes', 8½; Newcastle, 5s. to 10s.; Nitro-Phosphate, 16½; and Western Counties, 16½.

BWLCH UNITED MINES (Limited).—This property is situated in Cardiganshire, about 8½ miles east of Aberystwith. The ore is rich for silver. Valuable discoveries of ore-bearing ground have been made in the 60, and the ground standing whole to the 100, at which point it is entering a zone of ground which proved very profitable in the adjoining mine, having given 60,000l. profit. There is ample machinery for all purposes, the motive-power being water, which represents a considerable saving. A full force of men are now working in three shifts. The manager is considered a honest and good worker. The fact that the mine is productive and in active work is very important, as investors will thereby be saved those tedious delays and disappointments inseparable from progressive mines, and as the capital is small dividends are likely to be paid very soon. The shares are mostly in the hands of merchants and manufacturers, who paid a heavy premium for them, but at present they can be had at par. The capital is 20,000l., in 1l. shares, of which 5000 are held in reserve.

IRON COMPANIES.—Owing to the success of Messrs. Bolckow, Vaughan, and Company's new process for converting iron ores into steel, one or two iron properties in the South of England have recently been acquired to be worked as limited liability concerns. The following particulars refer to one of the most promising of them. It is situated at Turnchapel, near Plymouth. A sample of the ore has been analysed at Cardiff, and shows 67.2 per cent. for metallic iron, while the phosphorus is only 0.37, and sulphur absent. It may, therefore, be considered equal to Spanish, readily marketable, and nothing better than this could be desired for the steel manufacture. Freight is extremely low here, as the place has been used by vessels to put in and take refuse as ballast. The property is held under two leases, at similar and very moderate royalties—1d. per ton on limestone, 6d. on iron ore, 9d. on unwashed ochre, and 12d. on washed ochre. A few years ago, when trade was brisker, 15,000l. was the price of such a property as this, but now it has been acquired for 4500l., and is paid in shares. The company will not, therefore, have a huge capital to pay dividends upon, consequently, as the company is among the first to enter on this new field of enterprise, it has every prospect of quickly becoming a most profitable concern.

PENSALE COAL AND IRON COMPANY.—The report of this company is that Tankerville, Roman Gravel, and Van were purchased as going concerns. Hence the large sums of 68,000l., 84,000l., and 50,000l. must be deducted from the respective capitals as purchase-money, and not outlay in mining.



pany for the year ended March 31 last shows a profit of 6440Z, whereby the debit balance is reduced to 2114Z. The amount allowed for depreciation on ironworks and buildings was 1200Z, for collieries 1727Z, and 1024Z as full value of the mines got during the year. The directors consider trade cannot possibly go worse than at present; and since they have been able to effect so comparatively favourable a result in such times, they encourage the shareholders to hope that the time is not far distant when they will receive some return on their investment.

**OAKBANK OIL COMPANY (Limited).**—The tenth annual meeting was held on Tuesday in the offices of the company, Glasgow—Mr. R. Fraser, chairman, presiding. The report of the directors was submitted and adopted, and a dividend at the rate of 20 per cent. per annum proposed, half payable on June 13 and half on Dec. 13 next, free of income tax. Mr. Alexander C. Kirk was re-elected a director of the company, and Messrs. Bird and Affleck, C.A., were appointed auditors.

**BLOCHAIRN IRONWORKS.**—We understand that the negotiations for the purchase of these works are for the present practically suspended. It is said that some of the creditors are willing to accept the 50,000Z. offered, but that others consider it advisable to take no action in the matter until business improves.

J. GRANT MACLEAN, Stock and Share Broker.  
Post Office Buildings, Stirling, May 22.

**GRATUITOUS OFFICIAL MINERAL ASSAYS.**—A practice prevails in the French School of Mines which might probably be introduced with advantage at Jermyn-street. The Assay-office of the Ecole Nationale des Mines analyses gratuitously mineral substances when they are sent with an exact indication of the place, &c., whence they have been obtained. An idea may be formed of the services thus rendered from the statement that since the establishment of the school in 1845 up to 1877 they had made no less than 21,873 assays or analyses under the direction of the eminent mining engineers—Ebelman and Rivot, Moissenet and A. Carnot—who have been successively entrusted with this department. On

the occasion of the Universal Exhibition there was published a summary in three volumes of the analyses of iron ores, of mineral waters, and of drinking water, and also of phosphates of lime from French territory which had been made. During 1878 the Assay Office examined 722 specimens. The advantage which this system affords to the students in making them thoroughly acquainted with the largest possible variety of minerals is not less than the advantage to the public generally.

#### GEOLOGICAL SOCIETY OF LONDON.

May 14.—Prof. P. M. DUNCAN, M.B., F.R.S. (Vice-President), in the chair.

Noel W. Radston-Read, St. George's-road, was proposed as a Fellow; and Mr. Edouard Dupont, of Brussels; Dr. Franz von Kobell, of Munich; and Dr. Emile Sauvage, of Paris, were proposed as Foreign Correspondents of the Society.

The following communications were read:—

- 1.—"Further Observations on the Pre-Cambrian Rocks of Carnarvon," by Prof. T. M'Kenny Hughes, M.A., F.G.S.
- 2.—"Notes on the Structure of the Palaeozoic Districts of West Somerset," by A. Champarnowne, F.G.S., and W. A. E. Usher, F.G.S.
- 3.—"The Whin Sill of Teesdale as an Assimilator of the Surrounding Beds," by C. T. Clough, F.G.S.
- 4.—"On the Silurian Rocks of the Valley of the Clwyd," by Prof. T. M'Kenny Hughes, M.A., F.G.S.

The next meeting of the society will be held on Wednesday, when the following communications will be read:—1. "On the Endothiodont Reptilia, with evidence of the species Endothiodont uniseries, Owen," by Prof. R. Owen, C.B., F.R.S., F.G.S.—2. "Note on Eucamerotus, Hulke, = Ornithopsis, Seeley, = Bothriospondylus, Owen, = Chondrosteosaurus, Owen," by J. W. Hulke, F.R.S., F.G.S.—3. "Description of the species of the Ostracod genus Bairdia, M'Coy, from the Carboniferous Strata of Great Britain," by Prof. T. Rupert Jones, F.R.S., F.G.S., and James W. Kirby.—4. "Report on

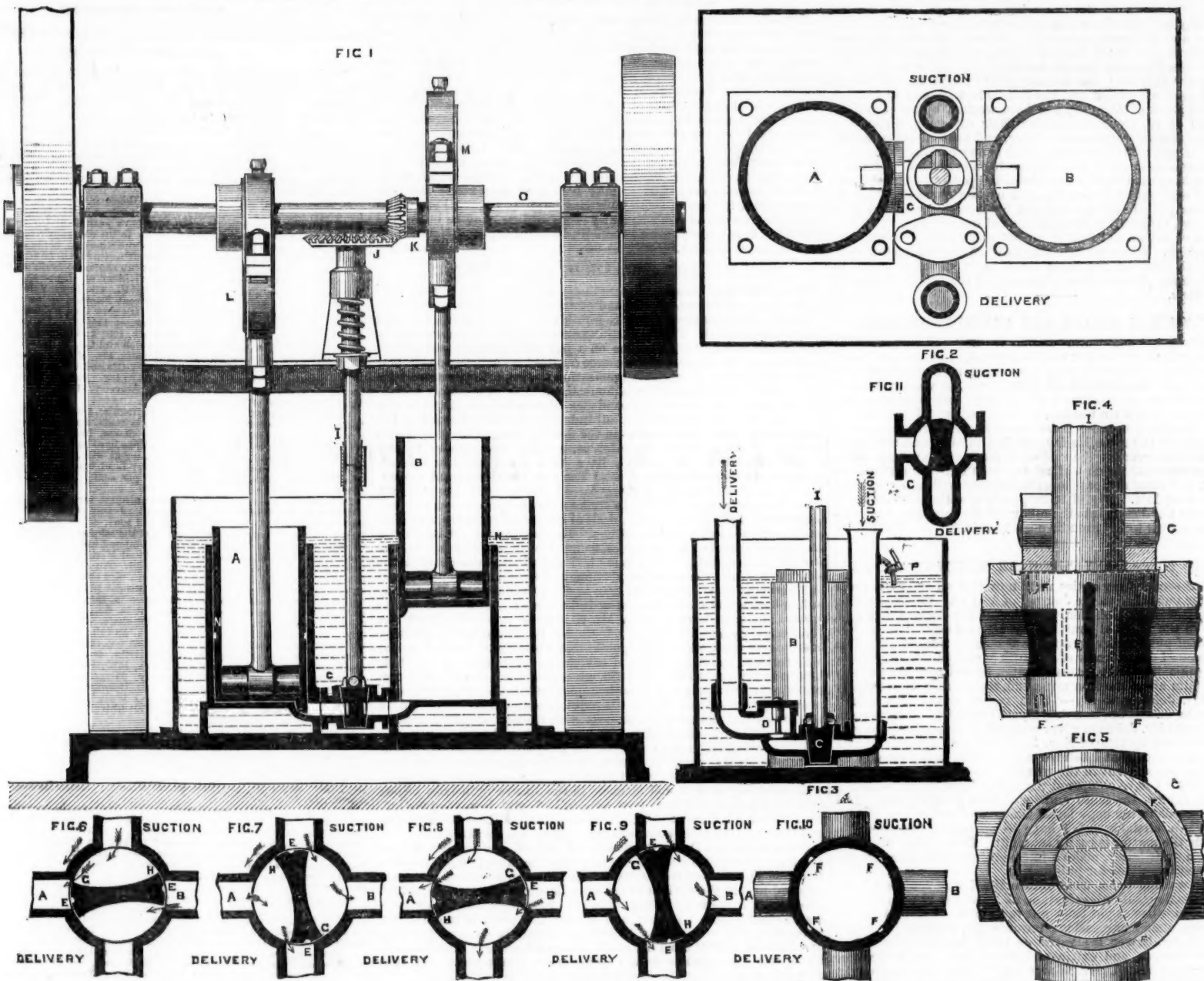
a Collection of Fossils from the Bowen River Coal Field and the Limestone of the Fanning River, North Queensland," by R. Etheridge, jun., F.G.S.—5. "On a Fossil Squilla from the London Clay of Highgate, part of the Wetherell Collection in the British Museum," by Dr. Henry Woodward, F.R.S., F.G.S.—6. "On Necrosella Wilsoni, a supposed Stomatopod Crustacean from the Middle Coal-measures, Cossall, near Ilkeston, Derbyshire," by Dr. Henry Woodward, F.R.S., F.G.S.—7. "On the discovery of a fossil Squilla in the Cretaceous Deposits of Hâkel, in the Lebanon, Syria," by Dr. Henry Woodward, F.R.S., F.G.S.—8. "On the Occurrence of a Fossil King-Crab (Limulus) in the Cretaceous Formation of the Lebanon, Syria," by Dr. Henry Woodward, F.R.S., F.G.S.

**CORNISH PUMPING ENGINES.**—The number of pumping-engines reported for April is 16. They have consumed 1685 tons of coal, and lifted 126 million tons of water 10 fms. high. The average duty of the whole is, therefore, 50,400,000 lbs. lifted 1 ft. high, by the consumption of 112 lbs. of coal. The following engines have exceeded the average duty:—

Cook's Kitchen—50 in.	Millions	51.3
South Condurrow—55 in.		50.7
West Bassett—Thomas's 80 in.		53.9
West Wheel France—55 in.		52.9
West Tolgus—Richard's 70 in.		52.5
West Wheel Seton—Harvey's 85 in.		71.1
West Wheel Seton—Rule's 70 in.		75.4

**HOLLOWAY'S OINTMENT.**—Bad legs, wounds, ulcers, and all descriptions of sores are cured by the proper and diligent use of these inestimable preparations. To attempt to cure bad legs by plastering the edges of the wound together is folly, for should the skin unite, a boggy, diseased condition remains underneath, to break out with tawdry fury in a few days. The only rational and permanent treatment, as indicated by nature, is to reduce the inflammation in and about the wound, to soothe the neighbouring nerves, to cool the heated blood as it courses along its vessels, and to render its watery, ichorous discharge consistent and healthy. Holloway's pills should likewise be taken to purify the blood and expel the noxious humours from the system.

## AIR COMPRESSING AND EXHAUSTING MACHINE.



### AIR COMPRESSING AND EXHAUSTING MACHINE.

We lately gave a short description of a new air-compressor, of which the above is an illustration, from which it will be seen the construction is so simple and efficient as to recommend it to the users of compressed air, who have long needed such a machine, especially of late years, owing to the rapidly increased use of compressed air for driving machinery, and various purposes.

This air-compressor, being practically without valves, may be worked at a high speed and pressure, without the noise, injury, and loss of power always attending more or less the use of valves. When running at 150 revolutions per minute the machine works almost as smoothly and quietly as at 50 revolutions, the only noise noticeable being that caused by the air flowing into the suction pipe. The machine consists of two vertical cylinders and plungers A and B, placed side by side, and actuated by two eccentrics L and M fixed on the shaft O, so that one is quite up when the other is quite down. The cylinders A and B stand in a tank of water, and a groove N is turned in the plungers, which at every stroke becomes full of water and is carried down by the plungers, thereby lubricating them and making them quite air-tight at a high pressure without any other packing being required.

The air enters and escapes from the cylinders A and B by a peculiarly formed cock C, the plug G H, which rotates continuously, and practically without friction, as it rests on a cushion of air and water, as will be presently explained. This cock is actuated by the rod I and bevel wheels J K, geared so that the cock makes one revolution for every two revolutions of the shaft O, hence it makes a quarter of a revolution during each complete stroke of the plungers A or B.

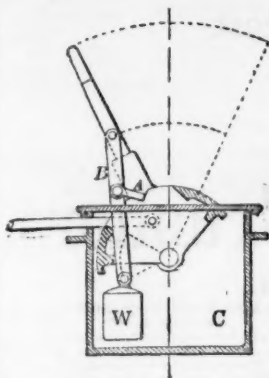
The Figs. 6, 7, 8, and 9 show different positions of the plug G H of the cock C, and will readily enable its action to be understood. When the plungers A and B are at the bottom and top of their

strokes, as shown in Fig. 1, the plug G H will be as in Fig. 6, that is, just opening for air to flow into cylinder A, and escape from cylinder B into a reservoir of compressed air, as shown by the arrows. While shaft O is making half a revolution, the plunger A is moving up and plunger B moving down, and the plug G H is moving from the position Fig. 6 to that of Fig. 7, which is the position it occupies when plunger A is at the top and plunger B at the bottom of the stroke. When the plug G H is as shown at Fig. 7 it is just opening for air to flow from cylinder A to the reservoir, and to admit air into cylinder B. When the shaft O has made another or second half revolution, so as to again reverse the position of the plungers A and B, bringing them, therefore, back to their original positions, as shown at Fig. 1, the plug G H will be in the position Fig. 8, that is just opening to admit air to cylinder A, and for the escape of air from cylinder B. The plug G H will occupy the position Fig. 9 when the shaft O has made another or third half revolution, so as to again place the plungers in position the reverse of those shown Fig. 1, and a fourth half revolution of shaft O will bring plungers A and B to positions shown Fig. 1, and plug G H to position Fig. 6, as at starting. By this arrangement air may be drawn in and compressed to any desired pressure without the small delivery valve D, which only serves as a check valve to prevent compressed air flowing into the cylinder full of air about to be compressed, and being expelled therewith, thus economising the power required to work the machine. The plug G H is kept in place by a spring acting on the plug rod I, so as to press it just sufficiently to overcome the tendency of the compressed air to lift the plug G H out of its seat or shell. The cock C is thoroughly lubricated by the grooves E and F, cut in the plug G H, and in shell—see Figs. 4, 9, and 10. The grooves E extend nearly the whole length of the plug G H, while the grooves F only extend for a short length at the top and bottom of the shell, as may be seen, Fig. 4. By this arrangement, when the rotation of the plug G H brings grooves E opposite grooves

F, the overlapping of the ends of grooves E and F allows the water in which the cock C is placed to fill up these grooves, thus making grooves full of water extending from top to bottom of the plug G H, and lubricating the whole of the rubbing surfaces. The grooves E and F not only serve to lubricate the cock C, so as to prevent the occurrence of unlubricated rings of rubbing surfaces, but they serve to admit small quantities of water regularly into the compressed air, so as to keep it cool. It will be seen that when the grooves E come opposite the air passages any water contained in them is drawn along with the air, and by making the grooves of suitable size as much water may be admitted as is necessary. A further quantity of water may, if desired, also be admitted into the compressed air by means of the small cock P, Fig. 3, on the suction air pipe, placed so as to dip into the surrounding water. The plug G H is readily accessible for examination, and appears to improve by being worked, as the surfaces become increasingly polished. Moreover, as the plug is but slightly conical, and revolves on a cushion of air and water as above mentioned, the tendency to differential wear is very slight, and practically without effect. The plungers also being simply packed with a groove full of water, as before explained, the whole thing is so simple that it may be kept in good order without difficulty. Our illustration shows a machine for working by pulley and belt, but the machine is also made complete in itself, by adapting steam cylinders acting direct on the shaft O by crank discs, the compressed air being maintained at any desired pressure by causing it to regulate the speed of the machine according to the quantity of air used. These machines are also equally efficient as an exhaustor, and are made in sizes to compress from 10 to 5000 cubic feet of air per minute to any pressure. They are made under the patent of Mr. E. Edwards, with improvements by the manufacturers, Messrs. Normandy, Stillwell, and Co., Custom House Station, Victoria Docks.



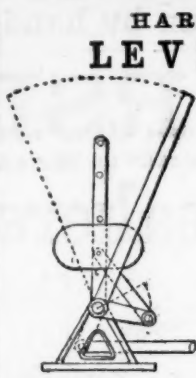
# SWITCHES AND CROSSINGS, FOR RAILWAYS AND TRAMWAYS, WITH PATENT LEVER BOXES.



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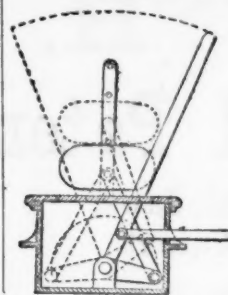
Can be set to work either way; by turning over the catch at A and reversing the lever, the weight W swings over to C, the catch preventing its return until again turned over. The reversing is effected with very little power, as the weight is raised but a few inches in the operation.



HARTLEY'S PATENT  
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Specially designed for Colliery Workings, or where economy of space is an object. Is reversible, and can be locked either way, or dead-locked, so as not to work at all.

Hartley's Patent Locking and  
Reversible Lever Boxes,



HALF UNDERGROUND,

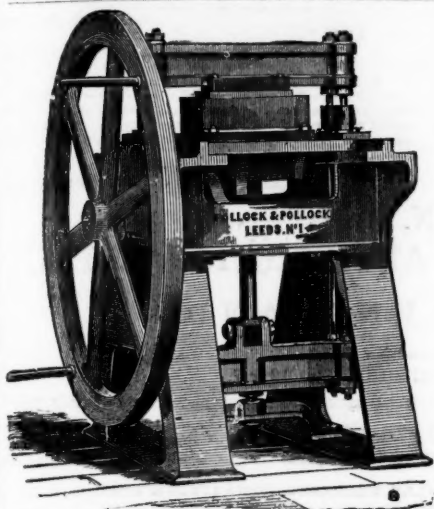
Will set over both ways, can be locked so as to work on one side only, or the switches can be locked on either side, so as not to work at all. Takes up less room than any other, as the weight does not turn over; works equally well if full of water; can be supplied at the price of an ordinary lever box.

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- " THE CRUMLIN VIADUCT WORKS COMPANY (LIMITED), South Wales.
- " T. T. J. WALLER, Esq., Railway Contractor, Gisburn, near Skipton.
- " TURNER AND SON, Limestone Quarries, Kiverton Park, near Sheffield.
- " THE CLIFTON AND KERSLEY COAL COMPANY, near Manchester.
- " THE ST. BRIDE'S WELSH SLATE AND SLAB COMPANY, Haverfordwest.
- " THE WARTON LAND COMPANY (LIMITED), Silverdale, near Carnforth.
- " THE MONTIPONI SOCIETY, Turin, Italy.

The following letter has recently been received from the Ebbw Vale Company:—  
GENTLEMEN,—I have much pleasure in stating that in the execution of your contract to drive, for the Ebbw Vale Steel, Coal, and Iron Company (Limited), a cross measure Drift from the Old Coal to the Rock Vein Coal, in the Glyn Pits, at Pontypool, you did so with dispatch, and to the entire satisfaction of all concerned. The distance driven was 453 yards in about 13 months.  
[The size of the above heading is 9 ft. by 13 ft.]

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Faced Backs.

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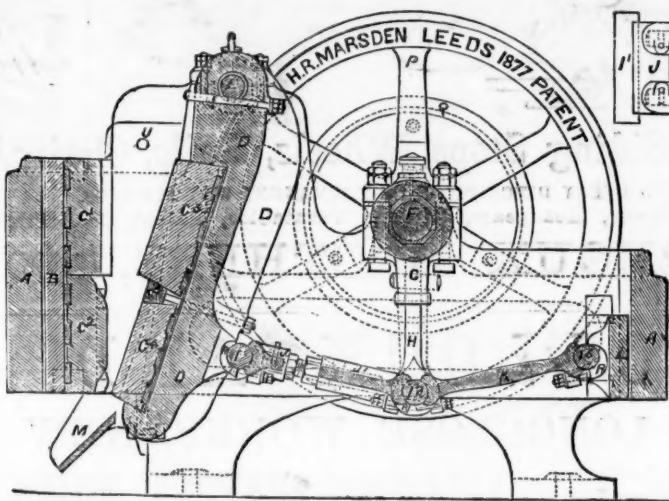
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NEW PATENT STEEL TOGGLE BEARINGS.

70

PRIZE MEDALS.



READ THIS—

Wharfedale Lime Works, Maryport, Whitehaven,  
November 7, 1878.  
H. R. MARSDEN, Esq., Soho Foundry, Meadow-lane, Leeds.  
DEAR SIR,—The machine I have in use is one of the large  
size, 24 in. by 12 in. The quantity we are breaking daily with  
this machine is 250 tons, the jaw being set to break to a  
size of 2½ in. We have, however, frequently broken over  
300 tons per day of ten hours, and on several occasions over  
350 tons during the same period. The stone we break is the  
blue mountain limestone, and is used as a flux in the various  
ironworks in this district. We have now had this machine in  
daily use for over two years without repairs of any kind, and  
have never had occasion to complain of any inconvenience in  
using the machine. I hope the one you are now making for  
me may do its work equally well. The cost—including EN-  
GINE-POWER, COALS, ENGINEMAN, FEEDING, and all EXPENSES  
OF EVERY KIND—is just 8d. per ton. Should any of your  
friends feel desirous of seeing one of your machines at work,  
I shall have much pleasure in showing the one alluded to.  
I am, dear Sir, yours very truly,  
WILLIAM MILLER.

AND THIS—

Wharfedale Lime Works, Aspatria, Cumberland,  
July 11th, 1878.  
H. R. MARSDEN, Esq., Soho Foundry, Leeds.  
DEAR SIR,—We are in receipt of your letter of 4th inst. I  
may just state that the stone breaker above named has been  
under my personal superintendence since its erection, and I  
have no hesitation in saying that it is as good now as it was  
five years ago.  
I am, dear Sir, yours faithfully,  
FRANCIS GOULD.

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